RECEIVED
CENTRAL FAX CENTER
APR 28 2008

Docket No.: 30012962-3 US (1509-264) **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	
WILCOCK, LAWRENCE *et al.*	Confirmation No. 5705
U.S. Patent Application No. 10/059,096	Group Art Unit: 2615
Filed: January 29, 2002	Examiner: Corey P Chau

For: AUDIO USER INTERFACE WITH CYLINDRICAL AUDIO FIELD ORGANIZATION

RESPONSE TO NOTICE OF NON-COMPLIANT APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notice of Non-Compliant Appeal Brief dated March 27, 2008, applicants resubmit herewith a revised Section V. Summary of the Claimed Subject Matter only, for the Appeal Brief filed March 10, 2008.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 08-2025 and please credit any excess fees to such deposit account.

Respectfully submitted,
LOWE HAUPTMAN HAM & BERNER, LLP

Lawrence WILCOCK et al.
Allan M. Lowe
Allan M. Lowe
Registration No. 19,641

1700 Diagonal Road, Suite 300
Alexandria, Virginia 22314
(703) 684-1111 AML/cjf
(703) 518-5499 Facsimile
Date: April 28, 2008

CERTIFICATION OF FACSIMILE TRANSMISSION
I HEREBY CERTIFY THAT THIS PAPER IS BEING FACSIMILE TRANSMITTED TO THE PATENT AND TRADEMARK OFFICE ON THE DATE SHOWN BELOW

CHRISTINA FRYE
TYPE OR PRINT NAME OF PERSON SIGNING CERTIFICATION
Christina F. 4/28/08
SIGNATURE DATE
571 273 8300
FACSIMILE NUMBER

RECEIVED
CENTRAL FAX CENTER
APR 28 2008

V. Summary of Claimed Subject Matter

Claim 1 is directed to an audio user-interface method. Each of a plurality of items is represented in an audio field by plural synthesized sound sources 40 from which sounds related to a particular item appear to emanate (Figs. 6-8, page 18, line 19). For each sound source, such as sound source 40A, Fig. 4, a determination is made of an associated rendering position where the synthesized sound source appears to emit sounds in the audio field including source 40A and other sources 40.

To understand the concept of rendering position, consider Fig. 4, wherein all of the sound sources 40 and 40A to be synthesized are in an audio field that lies on the surface of a sphere (page 17, lines 20-24). In Fig. 4, the user is wearing a pair of headphones and is assumed to have turned his head from the straight ahead position through an azimuth angle X2° (page 17, line 25). The straight ahead position of the user is indicated by audio field reference vector 42, while the turning angle of the user's head is indicated by presentation reference vector 44 (page 17, lines 25-28). The synthesized sound source 40A is azimuthally displaced from audio field reference vector 42 through an angle X1° (page 17, lines 22-24). Presentation reference vector 44 is also coincident with the center line between the headphones, indicated in Fig. 1 by audio output devices 11 (page 11, lines 9-12; page 10, lines 24-26). The azimuthal rendering position of sound source 40A relative to presentation reference vector 44 is equal to the azimuth angle (X1°) of sound source 40A from audio reference vector 42

minus the azimuthal angle of head rotation (X2°), so that the azimuth angle of the rendering position relative to presentation reference vector 44 is X1° - X2° (page 17, lines 29-30). In the spherical field of Fig. 4, where synthesized source 40A is at an elevation of Y1°, the elevation rendering position remains at Y1° (page 17, lines 29-32).

In the system of each of Figs. 6-8, where sound sources 40 lie on a cylindrical surface and the user is on the axis of the cylindrical surface, the associated rendering position where each synthesized sound source is located is determined in a similar manner through the use of presentation reference vector 54 and audio field reference vector 52 (page 18, lines 15-29). In the cylindrical field example of Figs. 6-8, only two coordinates are necessary to identify the location of each synthesized sound source 40 because all the synthesized sound sources are located on the cylindrical surface and thus are equidistant from the longitudinal axis of the vertically-oriented cylinder; the two coordinates are the azimuth angle X° and elevation or height Y, both measured relative to horizontal audio-field reference vector 52 (page 18, lines 18-22).

Audio output devices 11, being headphones on the user, are actually or notionally located inside the cylindrical locus of points defined by the cylindrical surface of Figs. 6-8 (Figs. 4, 5, 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

Claim 28 defines an apparatus for providing an audio user-interface including a processor arrangement illustrated, for example, in Fig. 1 or Fig. 10

(page 9, lines 26-28; page 18, lines 15 and 16; page 23, lines 16 and 17). Each of a plurality of items is represented in an audio field by plural synthesized sound sources 40 from which sounds related to a particular item appear to emanate (Figs. 6-8, page 18, line 19). For each sound source, such as sound source 40A, Fig. 4, a determination is made of an associated rendering position where the synthesized sound source appears to emit sounds in the audio field including source 40A and other sources 40.

In Fig. 4, all of the sound sources 40 and 40A to be synthesized are in an audio field that lies on the surface of a sphere (page 17, lines 20-24). In Fig. 4, the user is wearing a pair of headphones and is assumed to have turned his head from the straight ahead position through an azimuth angle X2° (page 17, line 25). The straight ahead position of the user is indicated by audio field reference vector 42, while the turning angle of the user's head is indicated by presentation reference vector 44 (page 17, lines 25-28). The synthesized sound source 40A is azimuthally displaced from audio field reference vector 42 through an angle X1° (page 17, lines 22-24). Presentation reference vector 44 is also coincident with the center line between the headphones, indicated in Fig. 1 by audio output devices 11 (page 11, lines 9-12; page 10, lines 24-26). The azimuthal rendering position of sound source 40A relative to presentation reference vector 44 is equal to the azimuth angle (X1°) of sound source 40A from audio reference vector 42 minus the azimuthal angle of head rotation (X2°), so that the azimuth angle of the rendering position relative to presentation reference vector 44 is X1° - X2° (page 17, lines 29-30). In the spherical field of Fig. 4,

where synthesized source 40A is at an elevation of Y1°, the elevation rendering position remains at Y1° (page 17, lines 29-32).

In the system of each of Figs. 6-8, where sound sources 40 lie on a cylindrical surface and the user is on the axis of the cylindrical surface, the associated rendering position where each synthesized sound source is located is determined in a similar manner through the use of presentation reference vector 54 and audio field reference vector 52 (page 18, lines 15-29). In the cylindrical field example of Figs. 6-8, only two coordinates are necessary to identify the location of each synthesized sound source 40 because all the synthesized sound sources are located on the cylindrical surface and thus are equidistant from the longitudinal axis of the vertically-oriented cylinder; the two coordinates are the azimuth angle X° and elevation or height Y, both measured relative to horizontal audio-field reference vector 52 (page 18, lines 18-22).

Audio output devices 11, being headphones on the user, are actually or notionally located inside the cylindrical locus of points defined by the cylindrical surface of Figs. 6-8 (Figs. 4, 5, 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

Apparatus claim 46 requires a rendering-position determining arrangement operative to determine for each sound source an associated rendering position at which the synthesized sound source is to sound in an audio field, wherein the rendering positions associated with the sound sources are on at least a portion of a cylindrical locus of points. In the embodiment of Fig. 1,

combiner 30 and the structures to which the combiner is responsive perform such a function (page 13, lines 30 and 31). Claim 46 also recites a rendering subsystem that includes spatialization processor 10 and source rendering position memory 15, as well as audio output devices, that are arranged to generate an audio field in which the sound sources are synthesized at their associated rendering positions to provide sounds related to the items associated with the synthesized sound sources (page 17, lines 1-7). Claim 46 also requires the audio output devices 11 (e.g., headphones on the user), to be actually or notionally located inside the cylindrical locus of points (Figs. 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

Independent method claim 15 is similar in certain respects to independent method claim 1. However, claim 15 does not require the synthesized sound sources to be on at least a portion of a cylindrical locus of points and, therefore, does not require the audio output devices to be located closer to a user of the audio output devices than the cylindrical locus of points. However, claim 15 does require the audio output devices 11 (e.g., headphones on the user in each of Figs. 4, 5, 7 and 8) to be actually or notionally located closer to a user of the audio output devices than the positions of the plural synthesized sound sources (page 10, lines 24-26; page 11, lines 26-26). In addition, claim 15 requires the audio field to be explored by rotating it about a predetermined axis (the vertical axis of the sphere in Figs. 4 and 5 on the vertical axis of the cylinder of Figs. 6-8), and by displacing the audio field in a direction parallel to that axis, wherein the rotating and displacing steps can be performed in any order or together (page 5,

lines 16-18; page 6, line 31-page 7, line 2; page 17, lines 18-20; page 10, lines 15-18).

Independent claim 37 is concerned with an apparatus for providing an audio user interface, as illustrated in Fig. 1. Each of a plurality of items is represented in the audio field (for example, the spherical field of Fig. 4 or the cylindrical field of Fig. 6) by two or more synthesized sound sources 40 from which sounds related to the item appear to emanate. The apparatus comprises audio output devices 11, for example, in the form of a set of headphones (Figs. 1, 4, 5, 7 or 8; page 10, lines 21, 22 and 24). The headphones are actually or notionally located closer to the user illustrated in Figs. 4, 5, 7 or 8 than the positions of synthesized sound sources 40 that are located on the spheres of Figs. 4 and 5 or the cylindrical surfaces of Figs. 6-8. The apparatus also includes a processor arrangement, in the form of combiner 30, Fig. 1, for determining, for each sound source 40, an associated rendering position where the sound source is to be synthesized in the audio field (page 16, lines 18 and 19). The rendering position is at the intersection of the audio field, which has a spherical shape in Figs. 4 and 5, and a cylindrical shape in Figs. 6-8 and is displaced from the position of the sound source, such as sound source 40A, so that the azimuthal rendering position is at the angle X1° - X2°, Fig. 4, where X1° is the azimuth angle of source 40A from audio field reference vector 42, which corresponds with the straight ahead position of the user, and X2° is the turning angle of the head of the user relative to the straight ahead position, as indicated by presentation reference vector 44, Fig. 4 (page 17, lines 20-31). The rendering position has an

elevation in the embodiments of Figs. 4 and 6 that is the same as the elevation angle of source 40A above the plane including audio field reference vector 42 (page 16, lines 17-21; page 17; line 30; page 20, lines 20 and 21).

Subsystem 13 of the processor arrangement sets the location of each sound source 40 relative to audio field reference 42, as illustrated in Figs. 4 and 5, or audio field reference 52, as illustrated in Figs. 6-8 (page 14, lines 4-6).

The processor arrangement also includes audio field orientation modifying block 26 for controlling an offset between the audio field reference 42 or the audio field reference 52 and the presentation vector 44 or the presentation vector 54; the offset is determined by the location of audio output devices 11 (e.g., the headphones) as indicated by head tracker 33, having an input supplied to audio field orientation modifying block 26 (page 15, line 31-page 16, line 7). Head tracker 33 is the claimed user input arrangement that enables the user to set the rotation of the audio field about the vertical axis coincident with the body of the user, in Fig. 4, and about the vertical axis defined by the dotted line in Figs. 6-8 (page 11, lines 9-18). User input 28 to block 26 also enables the user to displace of the audio field including synthesized sources 40 and 40A relative to the horizontal plane of presentation reference 44 in a direction parallel to the vertical axis (page 20, lines 18-20). The processor arrangement, including combiner 30 and spatialization processor 10, derives the rendering position of each sound source 40 based on the location of the sound source in the audio field and the offset derived by audio field orientation modifying block 26 (page 16, lines 17-21).

Headphones 11 and spatialization processor 10 generate an audio field in which sound sources 40 are synthesized at their associated rendering positions to provide sounds related to the items (page 17, lines 1-3).

The preamble of claim 55 is identical to that of claim 37. The apparatus of claim 55 includes a rendering-position determining arrangement that determines, for each sound source 40, an associated rendering position where the sound source is to be synthesized in the audio field including sound sources 40. The rendering-position determining arrangement includes a setting arrangement (page 14, lines 4-6), in the form of subsystem 13, for setting the location of each sound source 40 relative to an audio-field reference, in the form of vector 42, Figs. 4 and 5, or vector 52, Figs. 6-8. The rendering-position determining arrangement also includes a control arrangement, in the form of audio field orientation modifying block 26 for controlling an offset between the audio field reference 42 or 52 and a presentation reference, in the form of vector 44 or vector 54 (page 15, line 31-page 16, line 7). The predetermined reference is determined by the location of audio output devices 11, preferably a headset mounted on a user illustrated in Figs. 4, 5, 7 and 8 (page 15, line 31-page 16, line 7). The control arrangement also includes head-tracker 33 (Fig. 1; page 11, lines 9-18) and a user input 28 that respectively rotate the audio field about the vertical axes illustrated in Figs. 4-8 and displace the audio field relative to presentation vector 44 or 54 in a direction parallel to the vertical axis (page 20, lines 18-20). Combiner 30 responds to the positions of synthesized sources 40 and the offset determined by block 26 to derive the rendering position of each

sound source 40 (page 16, lines 17-21). A rendering subsystem including spatialization processor 10 and headphones 11 generates an audio field in which the sound sources are synthesized at their associated rendering positions to provide sounds related to the items (page 17, lines 1-3). Headphones 11 are actually or notionally located closer to a user of the headphones than the positions of synthesized sound sources 40 (Figs. 4, 5, 7 and 8; page 10, lines 24-26; page 11, lines 9-11).

Dependent claim 2 requires the audio field of claim 1 to be displaced in a direction parallel to the longitudinal (i.e., vertical in Figs. 6-8) axis of the cylindrical locus of points so that there is a change in the portion of the field closest to a reference position where a user of the audio output devices 11 is actually or notionally located (page 18, lines 27-29; Fig. 6).

Claim 3 indicates the audio field is rotated about the longitudinal axis (the vertical axis illustrated in Fig. 6) of the cylindrical locus of points (page 18. lines 23-25). Claims 4, 16, 31, 38, 49 and 56 require the audio field to be displaced in discrete steps of predetermined magnitude (page 19, lines 30-32; Fig. 8).

Claims 5 and 17 require the longitudinal axis of the cylindrical locus of points to be vertically disposed, as indicated in Fig. 8, and the sound sources to be located at differing levels corresponding to floors of a building; the predetermined magnitude of the displacement in discrete steps corresponds to moving the field up or down one floor (page 19, lines 30-32; Fig. 8).

Claims 6 and 18 indicate the sound sources 40 are arranged in groups, with the sound sources in each group being at the same position along the axis, as illustrated in Fig. 8. The groups are separate one from another along the axis by distances corresponding to multiples, including one, of the predetermined magnitude (page 19, lines 27-29).

Claims 9, 21, 34, 41, 52 and 59 state the sound sources outside of a focus zone, as illustrated in Fig. 8, are fully muted. An audio indication signals that the sound sources beyond the focus zone are present in the audio field (page 19, lines 5-8). The audio indication is stored in memory 14 of subsystem 13 (Fig. 15, includes collection representing sound source 20; page 30, line 26-page 31 line 24).

Claims 10, 22, 36, 45, 54 and 63 indicate the audio field is stabilized relative to any one of a user's head, a user's body, a vehicle in which the user is traveling, and the world (page 11, line 6-page 12, line 4). Claims 10 and 22 also require the stabilization to take into account whether the audio output devices are world, vehicle, body or head mounted, and as appropriate, rotation of the user's head or body, or of the vehicle, about an axis parallel to the longitudinal axis of the cylindrical locus of points (page 10, lines 15-28).

Claims 23, 42 and 60 indicate that the sound sources are distributed over at least a portion of a cylindrical locus of points (Figs. 6-8; page 18, line 18). Claims 24, 43 and 61 are similar to claims 23, 42 and 60 and require the sound

sources to be distributed in three dimensions in terms of a cylindrical coordinate system referenced to the axis (Figs. 6-8; page 18, line 18).

Claim 29, dependent on claim 28, states the processor arrangement of Fig. 1 is arranged for setting the location of each sound source 40 relative to audio field reference 52, a function performed, inter alia, by subsystem 13 (Fig. 1; page 18, lines 15-29). Claim 29 also indicates the processor arrangement of Fig. 1 controls an offset between audio field reference 52 and presentation reference 54, as determined by the location of audio output devices 11. The offset control is provided by audio field orientation modifying block 26 (page 15, line 31-page 16, line 7). The processor arrangement includes a user input arrangement including head tracker 33 that supplies an input to offset control block 26 and enables the user to set a displacement of the audio field including sound sources 40 relative to presentation reference 54 in a direction parallel to the longitudinal axis of the cylindrical locus of points, i.e., the vertical axis illustrated in Figs. 6-8 (page 15, line 31-page 16, line 7). The processor arrangement derives the rendering position of each sound source based on the location of the sound source in the audio field and the offset, a result provided by audio output devices 11 and spatialization processor 10 in response to the output of combiner 30 (page 17, lines 1-3).

Claims 30 and 48, dependent on claim 29, indicate the processor arrangement, in the form of offset block 26, enables the user to set the rotation of the audio field about the longitudinal axis of the cylindrical locus of points, i.e.,

the vertical axis of the cylinders illustrated in Figs. 6-8, that responds to head tracker 33 (page 11, lines 9-18).

Claims 31 and 56, respectively dependent on claims 29 and 55, indicate the processor arrangement or the controller arrangement, in the form of offset block 26, enables the audio field to be displaced in the direction parallel to the longitudinal vertical axis only in discrete steps of predetermined magnitude, a result achieved as a result of processor 26 being responsive to input 28 thereof (Fig. 8, page 19, lines 30-32).

Claim 47, dependent on claim 46, states the rendering-position determining arrangement of claim 46 includes a setting arrangement, in the form of subsystem 13, for setting the location of each of sound sources 40 relative to audio field reference 52 (page 14, lines 4-6). Claim 47 also requires the rendering-position determining arrangement to include a control arrangement, in the form of offset block 26, for controlling an offset between audio-field reference 42 or 52 and a presentation reference 44 or 54, determined by the location of audio output devices 11 (page 15, line 31-page 16, line 7). The control arrangement includes a user input arrangement, in the form of head tracker 33. The control arrangement also is operative to enable a user to set a displacement of the audio field relative to the presentation reference in a direction parallel to the longitudinal axis of the cylindrical locus of points, a result achieved by user input 28 that is coupled to offset arrangement 26 (page 20, lines 18-20). Claim 47 also indicates the rendering-position determining arrangement includes a

deriving arrangement, in the form of combiner 30 and spatialization processor 10, wherein the deriving arrangement derives the rendering position of each sound source 40 based on the location of the sound source in the audio field and the offset derived by offset block 26 (page 17, lines 1-3).

Claim 48, dependent on claim 47, indicates the control arrangement, in the form of offset block 26, enables a user to set the rotation of the audio field about the axis of the cylindrical locus of points, that is, the vertical axis illustrated in Figs. 6-8. This result is achieved by offset block 26 being responsive to head tracker 33 (page 15, line 31-page 16, line 7).

Claim 49, dependent on claim 47, requires the control arrangement, in the form of offset block 26, to displace the audio field including synthesized sound sources 40 in the direction of the longitudinal axis only in discrete steps of predetermined magnitude (Fig. 8, page 19, lines 30-32).

Claims 60, 66 and 67, dependent on claim 55, require the rendering position determining arrangement to cause the sound sources 40 to be on at least a portion of a cylindrical locus of points, as illustrated in Figs. 6-8, and discussed *supra* in connection with claim 1.

Claims 64 and 65 indicate the audio output devices are stereo headphones on the head of the user (page 11, lines 29, 30).